

WHAT IS CLAIMED IS:

1. A method for producing a crosslinked polymeric article comprising polymerizing a polycycloolefin monomer composition in contact with an addition polymerization catalyst in a mold having the shape of the article, wherein said catalyst comprises a cation complex containing a Group 10 transition metal and weakly coordinating anion complex, and wherein said monomer composition comprises a polycycloolefin monomer containing one polymerizable norbornene-type moiety and a multifunctional polycycloolefin monomer containing at least two polymerizable norbornene-type moieties.

2. A method of making a polymeric article by the in-mold addition polymerization of a polycycloolefin monomer composition comprising:

(a) combining a plurality of reactant streams to form a reaction mixture, at least one of said streams comprises a Group 10 transition metal procatalyst, and another of said reactant streams comprises an activator salt comprising cation and a weakly coordinating anion, wherein said cation is selected from the group consisting of a Group 1 element cation, a Group 2 metal cation, and a transition metal cation selected from the group consisting of zinc, silver and thallium, and at least one of said streams containing a polycycloolefin monomer containing one polymerizable norbornene-type moiety; and

(b) injecting said reaction mixture into a mold where polymerization occurs, forming a polymeric article in the shape of the mold.

3. The method of claim 2 wherein said polycycloolefin monomer composition includes a multifunctional polycycloolefin.

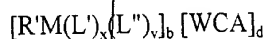
4. The method of claim 1 or 3 wherein said polycycloolefin monomer composition comprises from 0.25 to 99.75 mole % of a multifunctional polycycloolefinic monomer.

5. The method of claim 1 or 3 wherein said multifunctional polycycloolefin has a carbon to double bond ratio of from about 3.0 to about 17.

6. The method of claim 2 wherein said Group 1 element in said cation is selected from the group consisting of proton, lithium, sodium, and potassium.

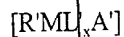
7. The method of claim 2 wherein said Group 2 metal in said cation is selected from the group consisting of magnesium, calcium, strontium, and barium.

8. The method of claim 1 wherein said catalyst is selected from a compound of the formula:



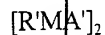
wherein M represents a Group 10 transition metal; R' represents an anionic hydrocarbyl ligand; L' represents a Group 15 neutral electron donor ligand; L'' represents a labile neutral electron donor ligand; x is 1 or 2; y is 0, 1, or 2; WCA represents a weakly coordinating counteranion complex; and b and d are numbers representing the number of times the cation complex and weakly coordinating counter anion complex are taken to balance the electronic charge of the overall catalyst complex.

9. The method of claim 2 wherein said Group 10 transition metal procatalyst is selected from a compound of the formula:



wherein M represents a Group 10 transition metal; R' represents an anionic hydrocarbyl ligand; L' represents a Group 15 neutral electron donor ligand; A' is an anionic leaving group; x is 1 or 2.

10. The method of claim 2 wherein at least one of said reactant streams contains a Group 15 electron donor ligand compound and said Group 10 transition metal procatalyst is selected from a compound of the formula:

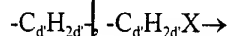


wherein M represents a Group 10 transition metal; R' represents an allylic ligand; L' represents a Group 15 neutral electron donor ligand; A' is an ionic leaving group.

11. The method of claim 8, 9, or 10 wherein M is selected from the group consisting of nickel, palladium, and platinum.

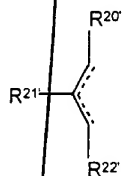
12. The method of claim 8 or 9 wherein R' is selected from the group consisting of hydrogen; linear and branched C<sub>1</sub>-C<sub>20</sub> alkyl; linear and branched C<sub>2</sub>-C<sub>20</sub> alkenyl; allylic ligands and canonical forms thereof; substituted and unsubstituted C<sub>3</sub>-C<sub>10</sub> cycloalkyl; substituted and unsubstituted C<sub>6</sub>-C<sub>15</sub> cycloalkenyl; substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl; substituted and unsubstituted, C<sub>6</sub>-C<sub>30</sub> aryl; C<sub>6</sub>-C<sub>30</sub> heteroatom containing aryl; wherein said heteroatom is selected from the group consisting of sulfur, oxygen, nitrogen, phosphorus, wherein the

substituents in said substituted radicals are selected from the group consisting of linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear or branched C<sub>2</sub>-C<sub>5</sub> alkenyl, haloalkenyl, halogen, and phenyl optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen; and a hydrocarbyl containing ligand selected from the formulae:



each of said ligands together with the Group 10 metal form a metallacycle or heteroatom containing metallacycle, wherein d' represents an integer from 3 to 10, and X→ represents an alkenyl or heteroatom containing moiety that coordinates to the Group 10 metal center.

13. The method of claim 12 wherein said allylic ligand is represented by the formula:

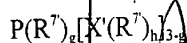


wherein R<sup>20'</sup>, R<sup>21'</sup>, and R<sup>22'</sup> each independently represent hydrogen, halogen, linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkenyl, C<sub>6</sub>-C<sub>30</sub> aryl, and C<sub>7</sub>-C<sub>30</sub> aralkyl, each of the foregoing radicals optionally substituted with a substituent selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, halogen, and phenyl which can optionally be substituted with linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen; any two of R<sup>20'</sup>, R<sup>21'</sup>, and R<sup>22'</sup> can be linked together with the carbon atoms to which they are attached to form a cyclic or multicyclic ring, each

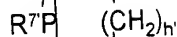
optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen.

14. The method of claim 8, 9, or 10 wherein said group  
15 electron donor ligand is selected from the group consisting of amines, pyridines, arsines, stibines and organophosphorus containing compounds.

15. The method of claim 14 wherein said organophosphorus  
containing ligand is selected from a compound of the formula:



wherein X' is oxygen, sulfur, nitrogen, or silicon; g is 0, 1, 2, or 3; h is 1, 2, or 3, with the proviso that when X' is a silicon atom, h is 3, when X' is an oxygen or sulfur atom h is 1, and when X' is a nitrogen atom, h is 2; R<sup>7</sup> is independently selected from hydrogen, linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, linear and branched C<sub>1</sub>-C<sub>10</sub> alkoxy, allyl, linear and branched C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>6</sub>-C<sub>12</sub> aryl, C<sub>6</sub>-C<sub>12</sub> aryloxy, C<sub>6</sub>-C<sub>12</sub> arylsulfides, C<sub>7</sub>-C<sub>18</sub> aralkyl, cyclic ethers and thioethers, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl)silyl, tri(C<sub>6</sub>-C<sub>12</sub> aryl)silyl, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkoxy)silyl, triaryloxysilyl, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl)siloxy, and tri(C<sub>6</sub>-C<sub>12</sub> aryl)siloxy, wherein each of the foregoing substituents can be optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, C<sub>1</sub>-C<sub>5</sub> alkoxy, halogen, and combinations thereof; when g is 0 and X' is oxygen, any two or 3 of R<sup>7</sup> can be taken together with the oxygen atoms to which they are attached to form a cyclic moiety; when g is 3 any two of R<sup>7</sup> can be taken together with the phosphorus atom to which they are attached to represent a phosphacycle of the formula:



wherein  $\text{R}^7$  is as previously defined and  $h'$  is an integer from 4 to 11.

16. The method of claim 15 wherein  $g$  is 3 and  $\text{R}^7$  is independently selected from the group consisting of hydrogen, linear and branched  $\text{C}_1\text{-C}_{10}$  alkyl,  $\text{C}_5\text{-C}_{10}$  cycloalkyl, linear and branched  $\text{C}_1\text{-C}_{10}$  alkoxy, allyl, linear and branched  $\text{C}_2\text{-C}_{10}$  alkenyl,  $\text{C}_6\text{-C}_{12}$  aryl, and  $\text{C}_6\text{-C}_{12}$  aryloxy.

17. The method of claim 15 wherein said organophosphorus containing ligand is a phosphine selected from the group consisting of trimethylphosphine, triethylphosphine, tri-*n*-propylphosphine, triisopropylphosphine, tri-*n*-butylphosphine, tri-*sec*-butylphosphine, tri-*i*-butylphosphine, tri-*t*-butylphosphine, tricyclopentylphosphine, triallylphosphine, tricyclohexylphosphine, triphenylphosphine, trinaphthylphosphine, tri-*p*-tolylphosphine, tri-*o*-tolylphosphine, tri-*m*-tolylphosphine, tribenzylphosphine, tri(*p*-trifluoromethylphenyl)phosphine, tris(trifluoromethyl)phosphine, tri(*p*-fluorophenyl)phosphine, tri(*p*-trifluoromethylphenyl)phosphine, allyldiphenylphosphine, benzyldiphenylphosphine, bis(2-furyl)phosphine, bis(4-methoxyphenyl)phenylphosphine, bis(4-methylphenyl)phosphine, bis(3,5-bis(trifluoromethyl)phenyl)phosphine, *t*-butylbis(trimethylsilyl)phosphine, *t*-butyldiphenylphosphine, cyclohexyldiphenylphosphine, diallylphenylphosphine, dibenzylphosphine, dibutylphenylphosphine, dibutylphosphine,

di-*t*-butylphosphine, dicyclohexylphosphine, diethylphenylphosphine,  
di-*i*-butylphosphine, dimethylphenylphosphine,  
dimethyl(trimethylsilyl)phosphine, diphenylphosphine,  
diphenylpropylphosphine, diphenyl(*p*-tolyl)phosphine,  
5 diphenyl(trimethylsilyl)phosphine, diphenylvinylphosphine,  
divinylphenylphosphine, ethyldiphenylphosphine,  
(2-methoxyphenyl)methylphenylphosphine, tri-*n*-octylphosphine,  
tris(3,5-bis(trifluoromethyl)phenyl)phosphine,  
tris(3-chlorophenyl)phosphine, tris(4-chlorophenyl)phosphine,  
10 tris(2,6-dimethoxyphenyl)phosphine, tris(3-fluorophenyl)phosphine,  
tris(2-furyl)phosphine, tris(2-methoxyphenyl)phosphine,  
tris(3-methoxyphenyl)phosphine, tris(4-methoxyphenyl)phosphine,  
tris(3-methoxypropyl)phosphine, tris(2-thienyl)phosphine,  
tris(2,4,6-trimethylphenyl)phosphine, tris(trimethylsilyl)phosphine,  
15 isopropylidiphenylphosphine, dicyclohexylphenylphosphine,  
(+)-neomenthyldiphenylphosphine, tribenzylphosphine,  
diphenyl(2-methoxyphenyl)phosphine,  
diphenyl(pentafluorophenyl)phosphine,  
bis(pentafluorophenyl)phenylphosphine, and  
20 tris(pentafluorophenyl)phosphine.

18. The method of claim 8 wherein said labile neutral electron  
donor ligand is selected from the group consisting of DMF, DMSO,  
cyclooctadiene, water, chlorinated alkanes, alcohols, ethers, ketones,  
25 nitriles, arenes, phosphine oxides, organic carbonates and esters.

19. The method of claim 9 or 10 wherein said anionic leaving  
group is selected from the group consisting of halogen, nitrate, triflate,  
triflimide trifluoroacetate, tosylate,  $\text{AlBr}_4^-$ ,  $\text{AlF}_4^-$ ,  $\text{AlCl}_4^-$ ,  $\text{AlF}_3\text{O}_3\text{SCF}_3^-$ ,  
30  $\text{AsCl}_6^-$ ,  $\text{SbCl}_6^-$ ,  $\text{SbF}_6^-$ ,  $\text{PF}_6^-$ ,  $\text{BF}_4^-$ ,  $\text{ClO}_4^-$ ,  $\text{HSO}_4^-$ , carboxylates, acetates,

acetylacetonates, carbonates, aluminates, borates, hydrocarbyl and  
halogenated hydrocarbyl selected from hydride, linear and branched C<sub>1</sub>-C<sub>5</sub>  
alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, C<sub>5</sub>-C<sub>10</sub>  
cyclohaloalkyl, C<sub>6</sub>-C<sub>10</sub> aryl, and C<sub>6</sub>-C<sub>10</sub> haloaryl, wherein said  
5 cyclohaloalkyl and haloaryl groups are monosubstituted or  
multisubstituted with a halogen group selected from bromine, chlorine,  
fluorine, and iodine.

20. The method of claim 2, 9, or 19 wherein said procatalyst is  
10 selected from a compound of group consisting of  
bis(triisopropylphosphine)(hydrido)palladium chloride,  
bis(triisopropylphosphine)(hydrido)palladium nitrate,  
bis(triisopropylphosphine)(hydrido)palladium triflate,  
(allyl)palladium(triisopropylphosphine) chloride,  
15 (methallyl)palladium(triisopropylphosphine) chloride,  
(crotyl)palladium(triisopropylphosphine) chloride,  
(allyl)palladium(triisopropylphosphine) trifluoroacetate,  
(1,1-dimethyl- $\pi$ -allyl(triisopropylphosphine)palladium trifluoroacetate,  
(2-chloroallyl)palladium(triisopropylphosphine) trifluoroacetate,  
20 (allyl)palladium(triisopropylphosphine) triflate,  
(crotyl)palladium(triisopropylphosphine) triflate,  
(methallyl)palladium(triisopropylphosphine) triflate,  
(allyl)palladium(triisopropylphosphine) triflimide,  
(methallyl)palladium(triisopropylphosphine) triflimide,  
25 bis(tricyclohexylphosphine)(hydrido)palladium chloride,  
bis(tricyclohexylphosphine)(hydrido)palladium nitrate,  
bis(tricyclohexylphosphine)(hydrido)palladium trifluoroacetate,  
bis(tricyclohexylphosphine)(hydrido)palladium formate,  
(allyl)palladium(tricyclohexylphosphine) chloride,  
30 (methallyl)palladium(tricyclohexylphosphine) chloride,



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22. The process of claim 21 wherein the weakly coordinating anion is a borate or aluminate of the formula:



wherein M' is boron or aluminum and R<sup>24'</sup>, R<sup>25'</sup>, R<sup>26'</sup>, and R<sup>27'</sup> independently represent fluorine, linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear

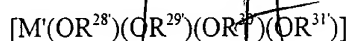
and branched C<sub>1</sub>-C<sub>10</sub> alkoxy, linear and branched C<sub>3</sub>-C<sub>5</sub> haloalkenyl, linear and branched C<sub>3</sub>-C<sub>12</sub> trialkylsiloxy, C<sub>18</sub>-C<sub>36</sub> triarylsiloxy, substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl, and substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryloxy groups, wherein R<sup>24</sup> to R<sup>27</sup> can not simultaneously represent alkoxy or simultaneously represent aryloxy, and wherein said aryl and aryloxy groups when substituted are monosubstituted or multisubstituted and said substituents are independently selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched C<sub>1</sub>-C<sub>12</sub> trialkylsilyl, C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine, bromine, and fluorine.

23. The process of claim 22 wherein said borate is selected from the group consisting of tetrakis(pentafluorophenyl)borate, tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, tetrakis(2-fluorophenyl)borate, tetrakis(3-fluorophenyl)borate, tetrakis(4-fluorophenyl)borate, tetrakis(3,5-difluorophenyl)borate, tetrakis(2,3,4,5-tetrafluorophenyl)borate, tetrakis(3,4,5,6-tetrafluorophenyl)borate, tetrakis(3,4,5-trifluorophenyl)borate, methyltris(perfluorophenyl)borate, ethyltris(perfluorophenyl)borate, phenyltris(perfluorophenyl)borate, tetrakis(1,2,2-trifluoroethylenyl)borate, tetrakis(4-tri-*i*-propylsilyltetrafluorophenyl)borate, tetrakis(4-dimethyl-*tert*-butylsilyltetrafluorophenyl)borate, (triphenylsiloxy)tris(pentafluorophenyl)borate, (octyloxy)tris(pentafluorophenyl)borate, tetrakis[3,5-bis[1-methoxy-2,2,2-trifluoro-1-(trifluoromethyl)ethyl]phenyl]borate, tetrakis[3-[1-methoxy-2,2,2-trifluoro-1-(trifluoromethyl)ethyl]-5-(trifluoromethyl)phenyl]borate, and tetrakis[3-[2,2,2-trifluoro-1-(2,2,2-

trifluoroethoxy)-1-(trifluoromethyl)ethyl]-5-(trifluoromethyl)phenyl]borate.

24. The process of claim 22 wherein said aluminate is selected from the group consisting of tetrakis(pentafluorophenyl)aluminate, tris(nonafluorobiphenyl)fluoroaluminate, (octyloxy)tris(pentafluorophenyl)aluminate, tetrakis(3,5-bis(trifluoromethyl)phenyl)aluminate, and methyltris(pentafluorophenyl)aluminate.

25. The process of claim 21 wherein the weakly coordinating anion is a borate or aluminate of the formula:



M' is boron or aluminum, R<sup>28</sup>, R<sup>29</sup>, R<sup>30</sup>, and R<sup>31</sup> independently represent linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>10</sub> haloalkyl, C<sub>2</sub>-C<sub>10</sub> haloalkenyl, substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl, and substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl groups, subject to the proviso that at least three of R<sup>28</sup> to R<sup>31</sup> must contain a halogen containing substituent; OR<sup>28</sup> and OR<sup>29</sup> can be taken together to form a chelating substituent represented by -O-R<sup>32</sup>-O-, wherein the oxygen atoms are bonded to M' and R<sup>32</sup> is a divalent radical selected from substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl and substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl, wherein said aryl and aralkyl groups when substituted are monosubstituted or multisubstituted and said substituents are independently selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched C<sub>1</sub>-C<sub>12</sub> trialkylsilyl,

C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine, bromine, and fluorine.

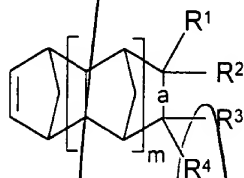
26. The process of claim 25 wherein said borate is selected  
5 from the group consisting of [B(O<sub>2</sub>C<sub>6</sub>F<sub>4</sub>)<sub>2</sub>]<sup>-</sup>, [B(OC(CF<sub>3</sub>)<sub>2</sub>(CH<sub>3</sub>))<sub>4</sub>]<sup>-</sup>,  
[B(OC(CF<sub>3</sub>)<sub>2</sub>H)<sub>4</sub>]<sup>-</sup>, [B(OC(CF<sub>3</sub>)(CH<sub>3</sub>)H)<sub>4</sub>]<sup>-</sup>, and [B(OCH<sub>2</sub>(CF<sub>3</sub>))<sub>4</sub>]<sup>-</sup>.

27 The process of claim 25 wherein said aluminate is selected  
from the group consisting of, [Al(OC(CF<sub>3</sub>)<sub>2</sub>Ph)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-  
10 CH<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)(CH<sub>3</sub>)H)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>H)<sub>4</sub>]<sup>-</sup>,  
[Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-*i*-Pr)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-*t*-butyl)<sub>4</sub>]<sup>-</sup>,  
[Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-SiMe<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-Si-*i*-Pr)<sub>4</sub>]<sup>-</sup>,  
[Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>-2,6-(CF<sub>3</sub>)<sub>2</sub>-4-Si-*i*-Pr)<sub>4</sub>]<sup>-</sup>,  
[Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>-3,5-(CF<sub>3</sub>)<sub>2</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>-2,4,6-(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, and  
15 [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>F<sub>5</sub>)<sub>4</sub>]<sup>-</sup>.

28. The process of claim 2, 9, or 10 wherein said activator salt  
is selected from the group consisting of  
lithium tetrakis(pentafluorophenyl)borate,  
20 sodium tetrakis(pentafluorophenyl)borate,  
lithium(diethyl ether) tetrakis(pentafluorophenyl)borate,  
lithium(diethyl ether)<sub>2.5</sub> tetrakis(pentafluorophenyl)borate,  
lithium tris(isopropanol) tetrakis(pentafluorophenyl)borate,  
lithium tetrakis(methanol) tetrakis(pentafluorophenyl)borate,  
25 silver tetrakis(pentafluorophenyl)borate,  
tris(toluene)silver tetrakis(pentafluorophenyl)borate,  
trityl tetrakis(pentafluorophenyl)borate,  
N,N-dimethylanilinium tetrakis(pentafluorophenyl)borate,  
lithium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate,  
30 sodium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate,

N,N-dimethylanilinium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 silver tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 tris(toluene)silver tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 thallium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  $\text{LiB}(\text{O}_2\text{C}_6\text{F}_4)_2$ ,  
 5  $\text{LiB}(\text{OC}(\text{CH}_3)(\text{CF}_3)_2)_4$ ,  $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{Ph})_4$ ,  $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{CH}_3)_4$ ,  
 $\text{LiAl}(\text{OC}(\text{CH}_3)(\text{CF}_3)_2)_4$ ,  $\text{LiAl}(\text{OC}(\text{CF}_3)_3)_4$ ,  $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-}i\text{-Pr})_4$ ,  
 $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_3\text{-3,5-}(\text{CF}_3)_2)_4$ ,  $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_2\text{-2,4,6-}(\text{CF}_3)_3)_4$ , and  
 $\text{LiAl}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{F}_5)_4$ .

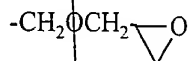
10 29. The process of claim 1, 2, 3, 8, 9, or 10 wherein said  
 polycycloolefin monomer composition includes a monomer selected from  
 a compound of the formula:



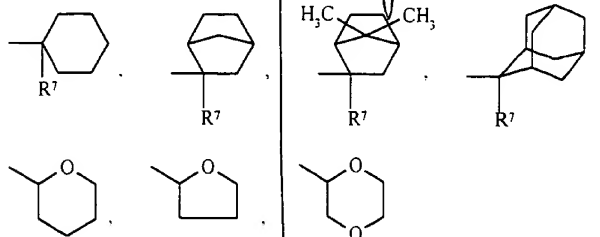
15 wherein "a" represents a single or double bond; m is an integer from 0 to  
 5; when "a" is a double bond one of  $\text{R}^1$ ,  $\text{R}^2$  and one of  $\text{R}^3$ ,  $\text{R}^4$  is not  
 present; and  $\text{R}^1$  to  $\text{R}^4$  independently represent hydrogen, substituted and  
 unsubstituted linear and branched  $\text{C}_1\text{-C}_{10}$  alkyl, linear and branched  $\text{C}_1\text{-C}_{10}$   
 haloalkyl, substituted and unsubstituted linear and branched  $\text{C}_2\text{-C}_{10}$   
 alkenyl, linear and branched  $\text{C}_2\text{-C}_{10}$  haloalkenyl, substituted and  
 20 unsubstituted linear and branched  $\text{C}_2\text{-C}_{10}$  alkynyl, substituted and  
 unsubstituted  $\text{C}_4\text{-C}_{12}$  cycloalkyl, substituted and unsubstituted  $\text{C}_4\text{-C}_{12}$   
 halocycloalkyl, substituted and unsubstituted  $\text{C}_4\text{-C}_{12}$  cycloalkenyl,  
 substituted and unsubstituted  $\text{C}_4\text{-C}_{12}$  halocycloalkenyl, substituted and  
 unsubstituted  $\text{C}_6\text{-C}_{12}$  aryl, substituted and unsubstituted  $\text{C}_6\text{-C}_{12}$  haloaryl  
 25 and substituted and unsubstituted  $\text{C}_7\text{-C}_{24}$  aralkyl,  $\text{R}^1$  and  $\text{R}^2$  or  $\text{R}^3$  and  $\text{R}^4$

can be taken together to represent a  $C_1$ - $C_{10}$  alkylidenyl group,

$-(CH_2)_n C(O)NH_2$ ,  $-(CH_2)_n C(O)Cl$ ,  $-(CH_2)_n C(O)OR^5$ ,  $-(CH_2)_n -OR^5$ ,  
 $-(CH_2)_n -OC(O)R^5$ ,  $-(CH_2)_n -C(O)R^5$ ,  $-(CH_2)_n -OC(O)OR^5$ ,  $-(CH_2)_n SiR^5$ ,  
 $-(CH_2)_n Si(OR^5)_3$ ,  $-(CH_2)_n C(O)OR^6$ , and the group:



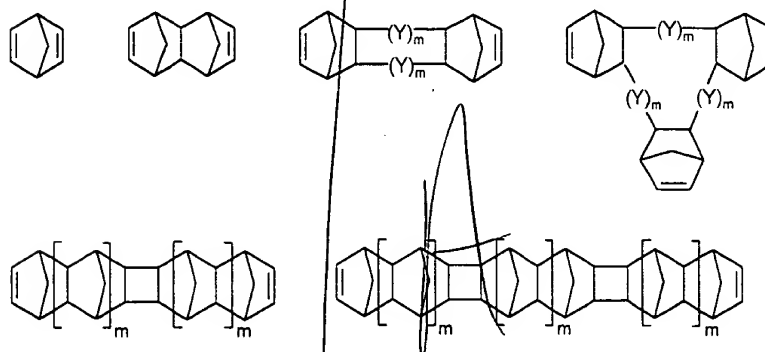
wherein  $n$  independently represents an integer from 0 to 10 and  $R^5$   
independently represents hydrogen, linear and branched  $C_1$ - $C_{10}$  alkyl,  
linear and branched,  $C_2$ - $C_{10}$  alkenyl, linear and branched  $C_2$ - $C_{10}$  alkynyl,  
 $C_5$ - $C_{12}$  cycloalkyl,  $C_6$ - $C_{14}$  aryl, and  $C_7$ - $C_{24}$  aralkyl;  $R^6$  represents a radical  
selected from  $-C(CH_3)_3$ ,  $-Si(CH_3)_3$ ,  $-CH(R^7)OCH_2CH_3$ ,  $-CH(R^7)OC(CH_3)_3$ ,  
dicyclopropylmethyl, dimethylcyclopropylmethyl, or the following cyclic  
groups:



wherein  $R^7$  represents hydrogen or a linear or branched ( $C_1$ - $C_5$ ) alkyl  
group;  $R^1$  and  $R^4$  together with the two ring carbon atoms to which they  
are attached can represent a substituted or unsubstituted cycloaliphatic  
group containing 4 to 30 ring carbon atoms, a substituted or unsubstituted  
aryl group containing 6 to 18 ring carbon atoms and combinations thereof;  
 $R^1$  and  $R^4$  can be taken together to form the divalent bridging group,  
 $-C(O)-Q-(O)C-$ , which when taken together with the two ring carbon

atoms to which they are attached form a pentacyclic ring, wherein Q represents an oxygen atom or the group  $N(R^8)$ , wherein  $R^8$  is selected from hydrogen, halogen, linear and branched  $C_1$ - $C_{10}$  alkyl, and  $C_6$ - $C_{18}$  aryl.

30. The process of claim 29 wherein said polycycloolefin composition includes a multifunctional polycycloolefin monomer selected from the formulae:



and mixtures thereof, wherein Y represents a  $(-CH_2-)$  group and m independently represents an integer from 0 to 5, and when m is 0, Y represents a single bond.

31. The process of claim 1, 2, 3, 8, 9, or 10 wherein said reaction mixture further comprises a rate moderator selected from the group consisting of water, tetrahydrofuran, 2-methyltetrahydrofuran, diethyl ether, methyl-*tert*-butyl ether, dimethoxyethane, diglyme, trimethylphosphine, triethylphosphine, tributylphosphine, tri(ortho-tolyl)phosphine, tri-*tert*-butylphosphine, tricyclopentylphosphine, tricyclohexylphosphine, triisopropylphosphine, trioctylphosphine, triphenylphosphine, tri(pentafluorophenyl)phosphine, methyldiphenylphosphine, dimethylphenylphosphine, trimethylphosphite,

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~~32.~~ A reactant formulation comprising a polycycloolefin monomer and a Group 10 transition metal procatalyst wherein said polycycloolefin-monomer comprises a multifunctional polycycloolefin containing at least two polymerizable norbornene-type moieties.

33. The reactant composition of claim 32 wherein said procatalyst is selected from a compound of the formula:



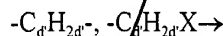
wherein M represents a Group 10 transition metal; R' represents an anionic hydrocarbonyl ligand; L' represents a Group 15 neutral electron donor ligand; A' is an anionic leaving group; x is 1 or 2.

34. The reactant composition of claim 33 wherein M is selected from the group consisting of nickel, palladium, and platinum.

35. The reactant composition of claim 33 wherein R' is selected from the group consisting of hydrogen; linear and branched C<sub>1</sub>-C<sub>20</sub> alkyl; linear and branched C<sub>2</sub>-C<sub>20</sub> alkenyl; allylic ligands and canonical forms thereof; substituted and unsubstituted C<sub>5</sub>-C<sub>10</sub> cycloalkyl; substituted and unsubstituted C<sub>6</sub>-C<sub>15</sub> cycloalkenyl; substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl; substituted and unsubstituted, C<sub>6</sub>-C<sub>30</sub> aryl; C<sub>6</sub>-C<sub>30</sub> heteroatom containing aryl; wherein said heteroatom is selected from the group consisting of sulfur, oxygen, nitrogen, phosphorus,

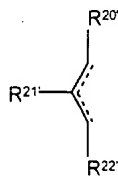


wherein the substituents in said substituted radicals are selected from the group consisting of linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear or branched C<sub>2</sub>-C<sub>5</sub> alkenyl, haloalkenyl, halogen, and phenyl optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen; and a hydrocarbyl containing ligand selected from the formulae:



each of said ligands together with the Group 10 metal form a metallacycle or heteroatom containing metallacycle, wherein d' represents an integer from 3 to 10, and X→ represents an alkenyl or heteroatom containing moiety that coordinates to the Group 10 metal center.

36. The reactant composition of claim 35 wherein said allylic ligand is represented by the formula:

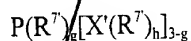


wherein R<sup>20'</sup>, R<sup>21'</sup>, and R<sup>22'</sup> each independently represent hydrogen, halogen, linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkenyl, C<sub>6</sub>-C<sub>30</sub> aryl, and C<sub>7</sub>-C<sub>30</sub> aralkyl, each of the foregoing radicals optionally substituted with a substituent selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, halogen, and phenyl which can optionally be substituted with linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen; any two of R<sup>20'</sup>, R<sup>21'</sup>, and R<sup>22'</sup> can be linked together with the carbon atoms to which they are attached to form a cyclic or multicyclic ring, each

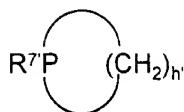
optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, and halogen.

37. The reactant composition of claim 33 wherein said group 15 electron donor ligand is selected from the group consisting of amines, pyridines, arsines, stibines and organophosphorus containing compounds.

38. The reactant composition of claim 37 wherein said organophosphorus containing ligand is selected from a compound of the formula:



wherein X' is oxygen, sulfur, nitrogen, or silicon; g is 0, 1, 2, or 3; h is 1, 2, or 3, with the proviso that when X' is a silicon atom, h is 3, when X' is an oxygen or sulfur atom h is 1, and when X' is a nitrogen atom, h is 2; R<sup>T</sup> is independently selected from hydrogen, linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, linear and branched C<sub>1</sub>-C<sub>10</sub> alkoxy, allyl, linear and branched C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>6</sub>-C<sub>12</sub> aryl, C<sub>6</sub>-C<sub>12</sub> aryloxy, C<sub>6</sub>-C<sub>12</sub> arylsulfides, C<sub>7</sub>-C<sub>18</sub> aralkyl, cyclic ethers and thioethers, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl)silyl, tri(C<sub>6</sub>-C<sub>12</sub> aryl)silyl, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkoxy)silyl, triaryloxysilyl, tri(linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl)siloxy, and tri(C<sub>6</sub>-C<sub>12</sub> aryl)siloxy, wherein each of the foregoing substituents can be optionally substituted with linear or branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear or branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, C<sub>1</sub>-C<sub>5</sub> alkoxy, halogen, and combinations thereof; when g is 0 and X' is oxygen, any two or 3 of R<sup>T</sup> can be taken together with the oxygen atoms to which they are attached to form a cyclic moiety; when g is 3 any two of R<sup>T</sup> can be taken together with the phosphorus atom to which they are attached to represent a phosphacycle of the formula:



wherein  $R^7$  is as previously defined and  $h'$  is an integer from 4 to 11.

39. The reactant composition of claim 38 wherein  $g$  is 3 and  $R^7$  is independently selected from the group consisting of hydrogen, linear and branched  $C_1$ - $C_{10}$  alkyl,  $C_5$ - $C_{10}$  cycloalkyl, linear and branched  $C_1$ - $C_{10}$  alkoxy, allyl, linear and branched  $C_2$ - $C_{10}$  alkenyl,  $C_6$ - $C_{12}$  aryl, and  $C_6$ - $C_{12}$  aryloxy.

40. The reactant composition of claim 37 wherein said organophosphorus containing ligand is a phosphine selected from the group consisting of trimethylphosphine, triethylphosphine, tri-*n*-propylphosphine, triisopropylphosphine, tri-*n*-butylphosphine, tri-*sec*-butylphosphine, tri-*i*-butylphosphine, tri-*t*-butylphosphine, tricyclopentylphosphine, triallylphosphine, tricyclohexylphosphine, triphenylphosphine, trinaphthylphosphine, tri-*p*-tolylphosphine, tri-*o*-tolylphosphine, tri-*m*-tolylphosphine, tribenzylphosphine, tri(*p*-trifluoromethylphenyl)phosphine, tris(trifluoromethyl)phosphine, tri(*p*-fluorophenyl)phosphine, tri(*p*-trifluoromethylphenyl)phosphine, allyldiphenylphosphine, benzyldiphenylphosphine, bis(2-furyl)phosphine, bis(4-methoxyphenyl)phenylphosphine, bis(4-methylphenyl)phosphine, bis(3,5-bis(trifluoromethyl)phenyl)phosphine, *t*-butylbis(trimethylsilyl)phosphine, *t*-butyldiphenylphosphine, cyclohexyldiphenylphosphine, diallylphenylphosphine, dibenzylphosphine, dibutylphenylphosphine, dibutylphosphine, di-*t*-butylphosphine, dicyclohexylphosphine, diethylphenylphosphine,

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divinylphosphine, dimethylphenylphosphine,  
dimethyl(trimethylsilyl)phosphine, diphenylphosphine,  
diphenylpropylphosphine, diphenyl(*p*-tolyl)phosphine,  
diphenyl(trimethylsilyl)phosphine, diphenylvinylphosphine,  
5 divinylphenylphosphine, ethyldiphenylphosphine,  
(2-methoxyphenyl)methylphenylphosphine, tri-*n*-octylphosphine,  
tris(3,5-bis(trifluoromethyl)phenyl)phosphine,  
tris(3-chlorophenyl)phosphine, tris(4-chlorophenyl)phosphine,  
tris(2,6-dimethoxyphenyl)phosphine, tris(3-fluorophenyl)phosphine,  
10 tris(2-furyl)phosphine, tris(2-methoxyphenyl)phosphine,  
tris(3-methoxyphenyl)phosphine, tris(4-methoxyphenyl)phosphine,  
tris(3-methoxypropyl)phosphine, tris(2-thienyl)phosphine,  
tris(2,4,6-trimethylphenyl)phosphine, tris(trimethylsilyl)phosphine,  
isopropylidiphenylphosphine, dicyclohexylphenylphosphine,  
15 (+)-neomenthyldiphenylphosphine, tribenzylphosphine,  
diphenyl(2-methoxyphenyl)phosphine,  
diphenyl(pentafluorophenyl)phosphine,  
bis(pentafluorophenyl)phenylphosphine, and  
tris(pentafluorophenyl)phosphine.

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41. The reactant composition of claim 33 wherein said labile neutral electron donor ligand is selected from the group consisting of DMF, DMSO, cyclooctadiene, water, chlorinated alkanes, alcohols, ethers, ketones, nitriles, arenes, phosphine oxides, organic carbonates and  
25 esters.

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42. The method of claim 33 wherein said anionic leaving group is selected from the group consisting of halogen, nitrate, triflate, triflimide trifluoroacetate, tosylate,  $\text{AlBr}_4^-$ ,  $\text{AlF}_4^-$ ,  $\text{AlCl}_4^-$ ,  $\text{AlF}_3\text{O}_3\text{SCF}_3^-$ ,  $\text{AsCl}_6^-$ ,  $\text{SbCl}_6^-$ ,  $\text{SbF}_6^-$ ,  $\text{PF}_6^-$ ,  $\text{BF}_4^-$ ,  $\text{ClO}_4^-$ ,  $\text{HSO}_4^-$ , carboxylates, acetates,

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acetylacetonates, carbonates, aluminates, borates, hydrocarbyl and  
halogenated hydrocarbyl selected from hydride, linear and branched C<sub>1</sub>-C<sub>5</sub>  
alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkyl, C<sub>5</sub>-C<sub>10</sub>  
cyclohaloalkyl, C<sub>6</sub>-C<sub>10</sub> aryl, and C<sub>6</sub>-C<sub>10</sub> haloaryl, wherein said  
5 cyclohaloalkyl and haloaryl groups are monosubstituted or  
multisubstituted with a halogen group selected from bromine, chlorine,  
fluorine, and iodine.

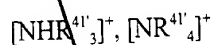
43. The reactant composition of claim 33 wherein said  
10 procatalyst is selected from a compound of group consisting of  
bis(triisopropylphosphine)(hydrido)palladium chloride,  
bis(triisopropylphosphine)(hydrido)palladium nitrate,  
bis(triisopropylphosphine)(hydrido)palladium triflate,  
(allyl)palladium(triisopropylphosphine) chloride,  
15 (methallyl)palladium(triisopropylphosphine) chloride,  
(crotyl)palladium(triisopropylphosphine) chloride,  
(allyl)palladium(triisopropylphosphine) trifluoroacetate,  
(1,1-dimethyl- $\pi$ -allyl(triisopropylphosphine)palladium trifluoroacetate,  
(2-chloroallyl)palladium(triisopropylphosphine) trifluoroacetate,  
20 (allyl)palladium(triisopropylphosphine) triflate,  
(crotyl)palladium(triisopropylphosphine) triflate,  
(methallyl)palladium(triisopropylphosphine) triflate,  
(allyl)palladium(triisopropylphosphine) triflimide,  
(methallyl)palladium(triisopropylphosphine) triflimide,  
25 bis(tricyclohexylphosphine)(hydrido)palladium chloride,  
bis(tricyclohexylphosphine)(hydrido)palladium nitrate,  
bis(tricyclohexylphosphine)(hydrido)palladium trifluoroacetate,  
bis(tricyclohexylphosphine)(hydrido)palladium formate,  
(allyl)palladium(tricyclohexylphosphine) chloride,  
30 (methallyl)palladium(tricyclohexylphosphine) chloride,



respectively, are taken to balance the electronic charge on the overall salt complex.

45. The composition of claim 44 wherein said Group I element cation is selected from the group consisting of a proton, lithium, sodium, and potassium; said Group II metal cation is selected from the group consisting of beryllium, magnesium, calcium, strontium, and barium; said transition metal cation is selected from the group consisting of zinc, silver, and thallium; and said organic group cation is selected from ammonium, phosphonium, carbonium and silylium cations.

46. The reactant composition of claim 45 wherein said ammonium cation is selected from a compound of the formulae:



wherein  $\text{R}^{41'}$  independently represents a hydrocarbyl, silylhydrocarbyl, or perfluorocarbyl group, each containing 1 to 24 carbon atoms.

47. The reactant composition of claim 45 wherein said carbonium cation is selected from a compound of the formula:

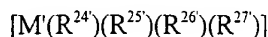


wherein  $\text{R}^{41'}$  independently represents a hydrocarbyl, silylhydrocarbyl, or perfluorocarbyl group, each containing 1 to 24 carbon atoms.

48. The reactant composition of claim 44 wherein said weakly coordinating counteranion is selected from the group consisting of

borates, aluminates, boratobenzene anions, carborane anions, and halocarborane anions.

49. The reactant composition of claim 48 wherein the weakly  
5 coordinating anion is a borate or aluminate of the formula:



wherein M' is boron or aluminum and R<sup>24</sup>, R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>  
10 independently represent fluorine, linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear  
and branched C<sub>1</sub>-C<sub>10</sub> alkoxy, linear and branched C<sub>3</sub>-C<sub>5</sub> haloalkenyl, linear  
and branched C<sub>3</sub>-C<sub>12</sub> trialkylsiloxy, C<sub>18</sub>-C<sub>36</sub> triarylsiloxy, substituted and  
unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl, and substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub>  
15 aryloxy groups, wherein R<sup>24</sup> to R<sup>27</sup> can not simultaneously represent  
alkoxy or simultaneously represent aryloxy, and wherein said aryl and  
aryloxy groups when substituted are monosubstituted or multisubstituted  
and said substituents are independently selected from linear and branched  
C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched  
C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched  
20 C<sub>1</sub>-C<sub>12</sub> trialkylsilyl, C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine,  
bromine, and fluorine.

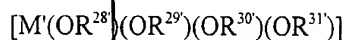
50. The reactant composition of claim 49 wherein said borate  
is selected from the group consisting of tetrakis(pentafluorophenyl)borate,  
25 tetrakis(3,5-bis(trifluoromethyl)phenyl)borate,  
tetrakis(2-fluorophenyl)borate, tetrakis(3-fluorophenyl)borate,  
tetrakis(4-fluorophenyl)borate, tetrakis(3,5-difluorophenyl)borate,  
tetrakis(2,3,4,5-tetrafluorophenyl)borate,  
tetrakis(3,4,5,6-tetrafluorophenyl)borate,  
30 tetrakis(3,4,5-trifluorophenyl)borate, methyltris(perfluorophenyl)borate,



ethyltris(perfluorophenyl)borate, phenyltris(perfluorophenyl)borate,  
tetrakis(1,2,2-trifluoroethyl)borate,  
tetrakis(4-tri-*i*-propylsilyltetrafluorophenyl)borate,  
tetrakis(4-dimethyl-*tert*-butylsilyltetrafluorophenyl)borate,  
5 (triphenylsiloxy)tris(pentafluorophenyl)borate,  
(octyloxy)tris(pentafluorophenyl)borate, tetrakis[3,5-bis[1-methoxy-2,2,2-  
trifluoro-1-(trifluoromethyl)ethyl]phenyl]borate,  
tetrakis[3-[1-methoxy-2,2,2-trifluoro-1-(trifluoromethyl)ethyl]-5-  
(trifluoromethyl)phenyl]borate, and tetrakis[3-[2,2,2-trifluoro-1-(2,2,2-  
10 trifluoroethoxy)-1-(trifluoromethyl)ethyl]-5-  
(trifluoromethyl)phenyl]borate.

51. The reactant composition of claim 49 wherein said  
aluminate is selected from the group consisting of  
15 tetrakis(pentafluorophenyl)aluminate,  
tris(nonafluorobiphenyl)fluoroaluminate,  
(octyloxy)tris(pentafluorophenyl)aluminate,  
tetrakis(3,5-bis(trifluoromethyl)phenyl)aluminate, and  
methyltris(pentafluorophenyl)aluminate.

52. The reactant composition of claim 48 wherein the weakly  
coordinating anion is a borate or aluminate of the formula:



25 M' is boron or aluminum, R<sup>28</sup>, R<sup>29</sup>, R<sup>30</sup>, and R<sup>31</sup> independently represent  
linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>10</sub> haloalkyl,  
C<sub>2</sub>-C<sub>10</sub> haloalkenyl, substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl, and  
substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl groups, subject to the proviso  
30 that at least three of R<sup>28</sup> to R<sup>31</sup> must contain a halogen containing

substituent; OR<sup>28</sup> and OR<sup>29</sup> can be taken together to form a chelating substituent represented by -O-R<sup>32</sup>-O-, wherein the oxygen atoms are bonded to M' and R<sup>32</sup> is a divalent radical selected from substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl and substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl, wherein said aryl and aralkyl groups when substituted are monosubstituted or multisubstituted and said substituents are independently selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched C<sub>1</sub>-C<sub>12</sub> trialkylsilyl, C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine, bromine, and fluorine.

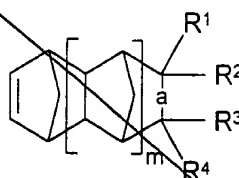
53. The reactant composition of claim 52 wherein said borate is selected from the group consisting of [B(O<sub>2</sub>C<sub>6</sub>F<sub>4</sub>)<sub>2</sub>]<sup>-</sup>, [B(OC(CF<sub>3</sub>)<sub>2</sub>(CH<sub>3</sub>))<sub>4</sub>]<sup>-</sup>, [B(OC(CF<sub>3</sub>)<sub>2</sub>H)<sub>4</sub>]<sup>-</sup>, [B(OC(CF<sub>3</sub>)(CH<sub>3</sub>)H)<sub>4</sub>]<sup>-</sup>, and [B(OCH<sub>2</sub>(CF<sub>3</sub>))<sub>4</sub>]<sup>-</sup>.

54 The reactant composition of claim 52 wherein said aluminate is selected from the group consisting of, [Al(OC(CF<sub>3</sub>)<sub>2</sub>Ph)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-CH<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)(CH<sub>3</sub>)H)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>H)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-*i*-Pr)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-*t*-butyl)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-SiMe<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-Si-*i*-Pr)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>-2,6-(CF<sub>3</sub>)<sub>2</sub>-4-Si-*i*-Pr)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>-3,5-(CF<sub>3</sub>)<sub>2</sub>)<sub>4</sub>]<sup>-</sup>, [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>-2,4,6-(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>]<sup>-</sup>, and [Al(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>F<sub>5</sub>)<sub>4</sub>]<sup>-</sup>.

55. The reactant composition of claim 44 wherein said activator salt is selected from the group consisting of lithium tetrakis(pentafluorophenyl)borate, sodium tetrakis(pentafluorophenyl)borate, lithium(diethyl ether) tetrakis(pentafluorophenyl)borate,

lithium(diethyl ether)<sub>2,5</sub> tetrakis(pentafluorophenyl)borate,  
 lithium tris(isopropanol) tetrakis(pentafluorophenyl)borate,  
 lithium tetrakis(methanol) tetrakis(pentafluorophenyl)borate, silver  
 tetrakis(pentafluorophenyl)borate, tris(toluene)silver  
 5 tetrakis(pentafluorophenyl)borate, trityl tetrakis(pentafluorophenyl)borate,  
 N,N-dimethylanilinium tetrakis(pentafluorophenyl)borate,  
 lithium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate,  
 sodium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate,  
 N,N-dimethylanilinium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 10 silver tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 tris(toluene)silver tetrakis[3,5-bis(trifluoromethyl)phenyl]borate,  
 thallium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, LiB(O<sub>2</sub>C<sub>6</sub>F<sub>4</sub>)<sub>2</sub>,  
 LiB(OC(CH<sub>3</sub>)(CF<sub>3</sub>)<sub>2</sub>)<sub>4</sub>, LiAl(OC(CF<sub>3</sub>)<sub>2</sub>Ph)<sub>4</sub>, LiAl(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CH<sub>3</sub>)<sub>4</sub>,  
 LiAl(OC(CH<sub>3</sub>)(CF<sub>3</sub>)<sub>2</sub>)<sub>4</sub>, LiAl(OC(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>, LiAl(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>-4-*i*-Pr)<sub>4</sub>,  
 15 LiAl(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>-3,5-(CF<sub>3</sub>)<sub>2</sub>)<sub>4</sub>, LiAl(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>-2,4,6-(CF<sub>3</sub>)<sub>3</sub>)<sub>4</sub>, and  
 LiAl(OC(CF<sub>3</sub>)<sub>2</sub>C<sub>6</sub>F<sub>5</sub>)<sub>4</sub>.

56 The reactant composition claim 32, 33, 43, 44, 48, or 55  
 wherein said polycycloolefin comprises a monomer selected from a  
 compound of the formula:

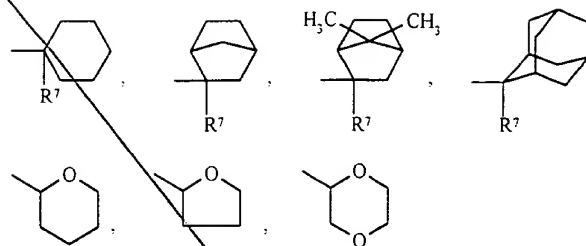


wherein "a" represents a single or double bond; m is an integer from 0 to  
 5; when "a" is a double bond one of R<sup>1</sup>, R<sup>2</sup> and one of R<sup>3</sup>, R<sup>4</sup> is not  
 25 present; and R<sup>1</sup> to R<sup>4</sup> independently represent hydrogen, substituted and  
 unsubstituted linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>10</sub>

haloalkyl, substituted and unsubstituted linear and branched C<sub>2</sub>-C<sub>10</sub>  
 alkenyl, linear and branched C<sub>2</sub>-C<sub>10</sub> haloalkenyl, substituted and  
 unsubstituted linear and branched C<sub>2</sub>-C<sub>10</sub> alkynyl, substituted and  
 unsubstituted C<sub>4</sub>-C<sub>12</sub> cycloalkyl, substituted and unsubstituted C<sub>4</sub>-C<sub>12</sub>  
 5 halocycloalkyl, substituted and unsubstituted C<sub>4</sub>-C<sub>12</sub> cycloalkenyl,  
 substituted and unsubstituted C<sub>4</sub>-C<sub>12</sub> halocycloalkenyl, substituted and  
 unsubstituted C<sub>6</sub>-C<sub>12</sub> aryl, substituted and unsubstituted C<sub>6</sub>-C<sub>12</sub> haloaryl  
 and substituted and unsubstituted C<sub>7</sub>-C<sub>24</sub> aralkyl, R<sup>1</sup> and R<sup>2</sup> or R<sup>3</sup> and R<sup>4</sup>  
 can be taken together to represent a C<sub>1</sub>-C<sub>10</sub> alkylidenyl group,  
 10 -(CH<sub>2</sub>)<sub>n</sub>C(O)NH<sub>2</sub>, -(CH<sub>2</sub>)<sub>n</sub>C(O)Cl, -(CH<sub>2</sub>)<sub>n</sub>C(O)OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>n</sub>-OR<sup>5</sup>,  
 -(CH<sub>2</sub>)<sub>n</sub>-OC(O)R<sup>5</sup>, -(CH<sub>2</sub>)<sub>n</sub>-C(O)R<sup>5</sup>, -(CH<sub>2</sub>)<sub>n</sub>-OC(O)OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>n</sub>SiR<sup>5</sup>,  
 -(CH<sub>2</sub>)<sub>n</sub>Si(OR<sup>5</sup>)<sub>3</sub>, -(CH<sub>2</sub>)<sub>n</sub>C(O)OR<sup>6</sup>, and the group:

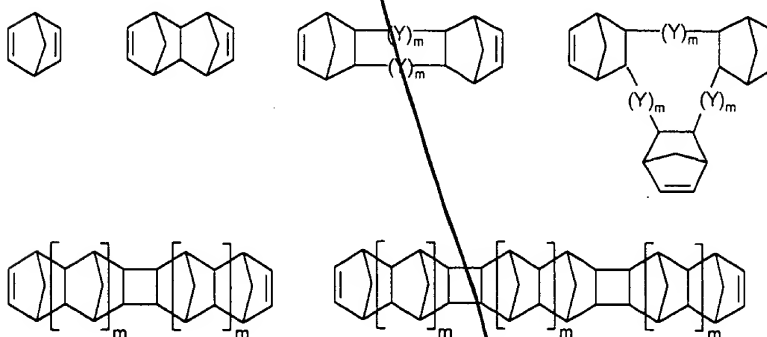


15 wherein n independently represents an integer from 0 to 10 and R<sup>5</sup>  
 independently represents hydrogen, linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl,  
 linear and branched, C<sub>2</sub>-C<sub>10</sub> alkenyl, linear and branched C<sub>2</sub>-C<sub>10</sub> alkynyl,  
 C<sub>5</sub>-C<sub>12</sub> cycloalkyl, C<sub>6</sub>-C<sub>14</sub> aryl, and C<sub>7</sub>-C<sub>24</sub> aralkyl; R<sup>6</sup> represents a radical  
 selected from -C(CH<sub>3</sub>)<sub>3</sub>, -Si(CH<sub>3</sub>)<sub>3</sub>, -CH(R<sup>7</sup>)OCH<sub>2</sub>CH<sub>3</sub>, -CH(R<sup>7</sup>)OC(CH<sub>3</sub>)<sub>3</sub>,  
 20 dicyclopropylmethyl, dimethylcyclopropylmethyl, or the following cyclic  
 groups:



wherein  $R^7$  represents hydrogen or a linear or branched ( $C_1$ - $C_5$ ) alkyl group;  $R^1$  and  $R^4$  together with the two ring carbon atoms to which they are attached can represent a substituted or unsubstituted cycloaliphatic group containing 4 to 30 ring carbon atoms, a substituted or unsubstituted aryl group containing 6 to 18 ring carbon atoms and combinations thereof;  $R^1$  and  $R^4$  can be taken together to form the divalent bridging group,  $-C(O)-Q-(O)C-$ , which when taken together with the two ring carbon atoms to which they are attached form a pentacyclic ring, wherein Q represents an oxygen atom or the group  $N(R^8)$ , wherein  $R^8$  is selected from hydrogen, halogen, linear and branched  $C_1$ - $C_{10}$  alkyl, and  $C_6$ - $C_{18}$  aryl.

57. The reactant composition of claim 55 wherein said multifunctional polycycloolefin monomer includes a monomer selected from a compound of the formula



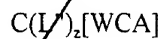
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and mixtures thereof, wherein Y represents a  $(-CH_2-)$  group and m independently represents an integer from 0 to 5, and when m is 0, Y represents a single bond.

5 58. The reactant composition of claim or 56 wherein said multifunctional polycycloolefin monomer is present in a range from 0.25 to 99.75 mole % of the total polycycloolefin monomer composition.

10 59. The reactant composition of claim 32, 33, 43, 44, 48, 55 or 56 wherein said composition further comprises a rate moderator selected from the group consisting of water, tetrahydrofuran, 2-methyltetrahydrofuran, diethyl ether, methyl-*tert*-butyl ether, dimethoxyethane, diglyme, trimethylphosphine, triethylphosphine, tributylphosphine, tri(ortho-tolyl)phosphine, tri-*tert*-butylphosphine, 15 tricyclopentylphosphine, tricyclohexylphosphine, triisopropylphosphine, trioctylphosphine, triphenylphosphine, tri(pentafluorophenyl)phosphine, methyldiphenylphosphine, dimethylphenylphosphine, trimethylphosphite, triethylphosphite, triisopropylphosphite, ethyl diphenylphosphinite, tributylphosphite, triphenylphosphite, diethylphenylphosphonite, and 20 tribenzylphosphine, 2-cyclohexenone, triphenylphosphine oxide, and mixtures thereof.

25 60. A salt composition comprising a compound of the formula:



wherein C is lithium or sodium, L'' is an alcohol and z is an integer between 2 and 8 inclusive, and WCA is a weakly coordinating counteranion.

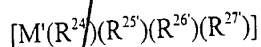
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61. The salt composition of claim 58 wherein said alcohol is represented by the formula  $R^9OH$ , wherein  $R^9$  represents linear and branched  $C_1-C_{20}$  alkyl, linear and branched  $C_1-C_{20}$  haloalkyl, substituted and unsubstituted  $C_3-C_{20}$  cycloalkyl, substituted and unsubstituted  $C_6-C_{18}$  aryl, substituted and unsubstituted  $C_6-C_{18}$  aralkyl, and substituted and unsubstituted norbornenyl wherein said substituents in said substituted groups are independently selected from linear and branched  $C_1-C_{12}$  alkyl, linear and branched  $C_1-C_5$  haloalkyl, linear and branched  $C_1-C_5$  alkoxy,  $C_6-C_{12}$  aryl, and halogen selected from chlorine, bromine, and fluorine.

62. The salt composition of claim 59 wherein said alcohol is selected from methanol, ethanol, n-propanol, isopropanol, *t*-butanol, and 5-norbornene-2-methanol.

63. The salt composition of claim 58 wherein said weakly coordinating counteranion is selected from borate or aluminate.

64. The salt composition of claim 61 wherein the weakly coordinating anion is a borate or aluminate of the formula:



wherein  $M'$  is boron or aluminum and  $R^{24}$ ,  $R^{25}$ ,  $R^{26}$ , and  $R^{27}$  independently represent fluorine, linear and branched  $C_1-C_{10}$  alkyl, linear and branched  $C_1-C_{10}$  alkoxy, linear and branched  $C_3-C_5$  haloalkenyl, linear and branched  $C_3-C_{12}$  trialkylsiloxy,  $C_{18}-C_{36}$  triarylsiloxy, substituted and unsubstituted  $C_6-C_{30}$  aryl, and substituted and unsubstituted  $C_6-C_{30}$  aryloxy groups, wherein  $R^{24}$  to  $R^{27}$  can not simultaneously represent alkoxy or simultaneously represent aryloxy, and wherein said aryl and

aryloxy groups when substituted are monosubstituted or multisubstituted and said substituents are independently selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched C<sub>1</sub>-C<sub>12</sub> trialkylsilyl, C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine, bromine, and fluorine.

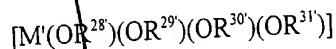
65. The salt composition of claim 62 wherein said borate is selected from the group consisting of tetrakis(pentafluorophenyl)borate, tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, tetrakis(2-fluorophenyl)borate, tetrakis(3-fluorophenyl)borate, tetrakis(4-fluorophenyl)borate, tetrakis(3,5-difluorophenyl)borate, tetrakis(2,3,4,5-tetrafluorophenyl)borate, tetrakis(3,4,5,6-tetrafluorophenyl)borate, tetrakis(3,4,5-trifluorophenyl)borate, methyltris(perfluorophenyl)borate, ethyltris(perfluorophenyl)borate, phenyltris(perfluorophenyl)borate, tetrakis(1,2,2-trifluoroethyl)borate, tetrakis(4-tri-*i*-propylsilyltetrafluorophenyl)borate, tetrakis(4-dimethyl-*tert*-butylsilyltetrafluorophenyl)borate, (triphenylsiloxy)tris(pentafluorophenyl)borate, (octyloxy)tris(pentafluorophenyl)borate, tetrakis[3,5-bis[1-methoxy-2,2,2-trifluoro-1-(trifluoromethyl)ethyl]phenyl]borate, tetrakis[3-[1-methoxy-2,2,2-trifluoro-1-(trifluoromethyl)ethyl]-5-(trifluoromethyl)phenyl]borate, and tetrakis[3-[2,2,2-trifluoro-1-(2,2,2-trifluoroethoxy)-1-(trifluoromethyl)ethyl]-5-(trifluoromethyl)phenyl]borate.

66. The salt composition of claim 62 wherein said aluminate is selected from the group consisting of



tetrakis(pentafluorophenyl)aluminate,  
tris(nonafluorobiphenyl)fluoroaluminate,  
(octyloxy)tris(pentafluorophenyl)aluminate,  
tetrakis(3,5-bis(trifluoromethyl)phenyl)aluminate, and  
methyltris(pentafluorophenyl)aluminate.

67. The salt composition of claim 61 wherein the weakly coordinating anion is a borate or aluminate of the formula:



M' is boron or aluminum, R<sup>28</sup>, R<sup>29</sup>, R<sup>30</sup>, and R<sup>31</sup> independently represent linear and branched C<sub>1</sub>-C<sub>10</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>10</sub> haloalkyl, C<sub>2</sub>-C<sub>10</sub> haloalkenyl, substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl, and substituted and unsubstituted C<sub>1</sub>-C<sub>30</sub> aralkyl groups, subject to the proviso that at least three of R<sup>28</sup> to R<sup>31</sup> must contain a halogen containing substituent; OR<sup>28</sup> and OR<sup>29</sup> can be taken together to form a chelating substituent represented by -O-R<sup>32</sup>-O-, wherein the oxygen atoms are bonded to M' and R<sup>32</sup> is a divalent radical selected from substituted and unsubstituted C<sub>6</sub>-C<sub>30</sub> aryl and substituted and unsubstituted C<sub>7</sub>-C<sub>30</sub> aralkyl, wherein said aryl and aralkyl groups when substituted are monosubstituted or multisubstituted and said substituents are independently selected from linear and branched C<sub>1</sub>-C<sub>5</sub> alkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkyl, linear and branched C<sub>1</sub>-C<sub>5</sub> alkoxy, linear and branched C<sub>1</sub>-C<sub>5</sub> haloalkoxy, linear and branched C<sub>1</sub>-C<sub>12</sub> trialkylsilyl, C<sub>6</sub>-C<sub>18</sub> triarylsilyl, and halogen selected from chlorine, bromine, and fluorine.

68. The salt composition of claim 65 wherein said borate is selected from the group consisting of [B(O<sub>2</sub>C<sub>6</sub>F<sub>4</sub>)<sub>2</sub>]<sup>-</sup>,

$[\text{B}(\text{OC}(\text{CF}_3)_2(\text{CH}_3))_4]^-$ ,  $[\text{B}(\text{OC}(\text{CF}_3)_2\text{H})_4]^-$ ,  $[\text{B}(\text{OC}(\text{CF}_3)(\text{CH}_3)\text{H})_4]^-$ , and  $[\text{B}(\text{OCH}_2(\text{CF}_3))_4]^-$ .

69 The salt composition of claim 65 wherein said aluminate is selected from the group consisting of,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{Ph})_4]^-$ ,

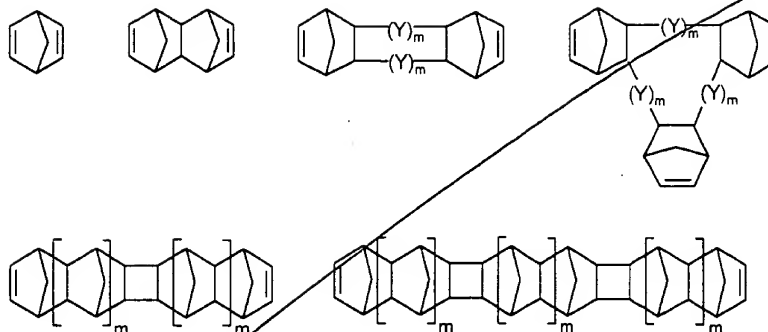
$[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-CH}_3)_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_3)_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)(\text{CH}_3)\text{H})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{H})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-}i\text{-Pr})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-}t\text{-butyl})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-SiMe}_3)_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_4\text{-4-Si-}i\text{-Pr})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_2\text{-2,6-(CF}_3)_2\text{-4-Si-}i\text{-Pr})_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_3\text{-3,5-(CF}_3)_2)_4]^-$ ,  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{H}_2\text{-2,4,6-(CF}_3)_3)_4]^-$ , and  $[\text{Al}(\text{OC}(\text{CF}_3)_2\text{C}_6\text{F}_5)_4]^-$ .

70. The salt composition of claim 58 selected from the group consisting of lithium tris(isopropanol) tetrakis(pentafluorophenyl)borate, and lithium tetrakis(methanol) tetrakis(pentafluorophenyl)borate.

71. A crosslinked addition polymer polymerized from a monomer mixture comprising a polycycloolefin containing one polymerizable norbornene-type moiety and a multifunctional polycycloolefin containing at least two polymerizable norbornene-type moieties.

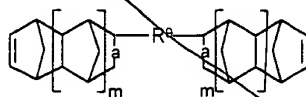
72. The crosslinked addition polymer of claim 69 wherein said monomer mixture comprises from 0.25 to 99.75 mole % of a multifunctional polycycloolefin monomer.

73. The crosslinked addition polymer of claim 69 wherein multifunctional polycycloolefin monomer includes a monomer selected from a compound of the formula:



and mixtures thereof, wherein Y represents a  $(-\text{CH}_2-)$  group and m independently represents an integer from 0 to 5, and when m is 0, Y represents a single bond.

74. The multifunctional polycycloolefin monomer set forth in claims 29, 55, and 69 wherein said monomer is selected from a composition of the formula:



wherein "a" independently represents a single or double bond, m independently is an integer from 0 to 5,  $\text{R}^9$  is a divalent radical selected from divalent hydrocarbyl radicals and divalent ether radicals.

75. The multifunctional polycycloolefin monomer of claim 72 wherein said hydrocarbyl radical is selected from  $\text{C}_1 - \text{C}_{10}$  alkylene radicals and divalent aromatic radicals.

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76. The multifunctional polycycloolefin monomer of claim 72 wherein said divalent ether radical is selected from a radical of the formula  $-R^{10}-O-R^{10}-$ , wherein  $R^{10}$  represents a hydrocarbyl radical.

77. The multifunctional polycycloolefin monomer of claim 74 wherein  $R^{10}$  independently is selected from the group consisting of  $C_1-C_{10}$  alkylene, divalent aromatic radicals, and combinations thereof.

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